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ABSTRACT

Often during budget time, school boards are faced with the dilemma of whether to designate funds for teachers and teaching materials or for buses and buildings. Frequently, this leads to the impression that buses and buildings consume too much of the budget and have no direct relationship to the student. This report examines the validity of this impression. It provides a definition of what constitutes part of a facility and includes features such as color, maintenance, age, classroom structure, climate conditions, student density, noise, and lighting. Research on the relationships between facilities and student achievement, as well as performance and attitudes is reviewed. The report describes the difficulties inherent in this kind of research, and examines some of the research syntheses that have focused on the correlation between student learning and the condition of facilities. Studies of facilities' variables reported that student achievement scores were higher when windows, floors, heat, roofs, locker conditions, ceilings, laboratory conditions, age of the facility, lighting, interior paint, clean floors, and cosmetic conditions in general were rated above standard by school staff. Studies suggested that the facilities also affected attitudes and behaviors. It is suggested that the place where students learn can encourage good student behaviors. (RJM)

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WHERE CHILDREN LEARN
A Discussion of How a Facility Affects Learning

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WHERE CHILDREN LEARN

A Discussion of How a Facility Effects Learning

INTRODUCTION

Often during budget time, school boards are faced with the dilemma of whether to designate funds for teachers and teaching materials or buses and buildings. Indeed, the interpretation is that buses and buildings consume more than their "fair" share and have no direct relationship to the learner. This presentation will look at the validity of this interpretation.

Before looking at the research, however, a definition is needed of what will be considered as part of the facility. For the purpose of this discussion the following will be considered: color, maintenance, age, classroom structure, climate conditions, density, noise, and lighting.

Research on facilities and student achievement, performance, and attitudes was reviewed by Weinstein in 1979 and McGuffey in 1982. These researchers provided syntheses of 232 studies. There have been many studies completed since Weinstein's and McGuffey's reviews in 1979 and 1982;

therefore, Lemasters' (1997) synthesis was conducted for the ensuing years. The findings from the three syntheses indicated that when school boards put funds in line items other than teachers and instructional materials, they continue indirectly to contribute to improved instruction.

DIFFICULTIES OF DOING SUCH RESEARCH

In looking at the research concerning facilities, one must make conclusions that weigh the difficulties of control in educational research. It is difficult in the educational setting to randomly assign teachers and students and to have the funding to randomly change the physical settings. There are grave problems in education in trying to match teaching methods, student abilities, and physical learning climates while conducting research. There may be moral questions as to the appropriateness of doing such and making the research public, as well as legal questions of privacy.

THE McGUFFEY AND WEINSTEIN SYNTHESES

There will be a review of the conclusions that are drawn from the research, looking at the information that the research provides the educator and the building designer. Two syntheses by McGuffey (1982) and Weinstein (1979) will be reviewed. Finally, conclusions from the those two

syntheses will be compared to the more recent research by Lemasters (1997) and included in this discussion.

Weinstein

Weinstein conducted her research synthesis at the time that educators were involved in the open education programs and the open space school. Much of the research she presented is probably less relevant today than 30 years ago, as open space classrooms were very popular during the late 1960's and early 1970's. However, there have been recent articles in design manuals that seem to indicate that the designers, at least, may be considering open space designs once again. Her work probably did not assist the educator or design professional very much, as one could conclude from her study of the research that students perform just as well in an open space classroom as in a standard classroom.

She did say that the as far as non-achievement behaviors were concerned there was considerable evidence that the physical environment did have an influence. High student density in the studies she cited contributed to dissatisfaction, decreased social interaction, and increased aggression on the part of the students. She also found that "soft" classrooms, which were described as student friendly, were positively associated with better attendance, greater participation in classroom work, and

positive attitudes towards teachers and classmates. She encouraged further research as she believed that more positive student attitudes and behaviors may result in increased student achievement.

McGuffey

McGuffey put forth two main conclusions: old and obsolete buildings do have a negative effect upon the learning process of students, and safe, modern, and controlled environment facilities enhance the learning process. He also stated that school facilities may have a differential impact upon the performance of students in different grades and subjects. Whatever impact school facilities may have upon students may be greater in certain grade levels and subject areas than in others. The longevity and student age factors may play a part in determining the effect a building has upon the users.

School Building Age: McGuffey reviewed seven studies and building age was significant as a contributor to student achievement and behavior. It was significant, as well, that building age was a surrogate for variables such as condition of the building, thermal control, proper lighting, acoustical control, condition of laboratories, and aesthetic conditions.

Thermal Factors: Eight of the nine studies found a significant relationship between a controlled environment and student achievement.

Visual Factors: McGuffey found more studies in this areas than in any other single area. Good lighting quality was found to be positively related to increase in student achievement and performance.

Color and Interior Painting: There were four studies found that color had an impact upon student achievement.

Hearing Factors. Unwanted noise at high decibel levels had an adverse effect upon learning; however, the noise level of noise must be at the extreme level to have significant impact.

Amount of Space: McGuffey discovered no significant findings.

Building Maintenance: Properly maintained facilities were found to improve student attitudes.

Size of School: The larger the school the higher the student achievement was.

Lighting: Windowless facilities, underground facilities, site size, were not found to have significant relationships on student performance.

Although McGuffey found that the explainable variance in learning that can be attributed to the school building is small, it is a variable over which the designer and educator has control.

THE LEMASTERS SYNTHESIS

Age of the Facility

- Students had higher achievement scores in newer facilities. Indeed, as the age of the facilities decreased, there was a corresponding increase in scores in mathematics, reading, and composition.
- There were fewer discipline incidents in newer facilities.
- Attendance records were better in the new facilities.
- Social climate factors perceived by students were considerably more favorable in a new school.

Condition of the Facility

- As the condition of the facility improved, achievement scores improved.
- Stimulating environments promoted positive attitudes in students.
- Higher student achievement was associated with schools with better science laboratories. Furthermore, attitudes toward the science classroom predicted science achievement.
- There was a consistent pattern of higher achievement in air conditioned schools.
- Achievement was greater in facilities that allowed for individual preferences for heat.

Color of the Indoor Facilities

- Higher student achievement was associated with schools with pastel painted walls.
- There seemed to be a cause-effect relationship between the variables of color and light and students' blood pressures.
- Relaxing shades of blue significantly reduced blood pressure.

Unrelated Noise on the Outside of the building

- Higher student achievement was associated with schools with less external noise.
- Outside noise caused students to be dissatisfied with their classrooms.
- Excessive temperatures and noise caused stress in students.

Light inside Facilities

- There seemed to be a cause-effect relationship between the variables of color and light and students' blood pressures.
- Under some conditions, classrooms having fluorescent lighting without an ultra-violet component had higher absence rates. Classrooms with full-spectrum lighting with ultra violet content had a

significant positive effect on attendance. In general, light with ultra-violet content appeared to improve student health.

- Light had a positive effect on achievement.
- Daylight in the classroom seemed to foster higher achievement.

Density in the Classroom

- Students seek areas of privacy in the classroom. Students were most often not comfortable in low privacy areas.
- Open-plan classrooms had higher levels of off-task behavior. Students spent their time in less educationally valuable ways in more open classroom units.
- Students experienced more anxiety in the open-plan classrooms.
- Density was a significant predictor of task inattention.
- Overcrowding had a negative impact on student achievement in poorer school districts.
- Openness of the classroom perimeter explained a significant proportion of the variance in absenteeism, task inattention, and fidgeting.

PRACTICAL CONCLUSIONS

As was stated in the introduction, the General Accounting Office (GAO) suggested fourteen million students attend schools needing extensive repair or replacement. According to Senator Moseley-Braun (press release, June 21, 1996),

> Crumbling schools is not just an inner city problem. It is not a problem for poor children, or for minority children. . . .It is an American problem--and it relates directly to our future. . . . America can't compete if our students can't learn; and our students can't learn if their schools are falling down.

From state and federal documents presented in the GAO study and from the available research on how the facility affects student achievement and behavior, it is illogical that resources are not available to address maintenance, renovation, and construction needs. In the State of Virginia, for example, the allocation for maintenance of facilities is very small. The funding is static, as the legislature often lowers the allocation when the budget is tight. As for the construction of new facilities, the Commonwealth provides only funds for loans. There are many problems contributing to this lack of action.

However, Virginia is not the only state that responds to facility needs in such a manner. There are approximately thirty-three more who follow such a funding pattern, leaving the place where the student learns as a less than high priority item in the state budget. Perhaps the proposed initiatives of President Clinton for improving the school buildings of the country will move the states toward action.

With this possibility of increased fund, designers and educators need to become knowledgeable about the data from the research. Thus, when the funds become available, designers can incorporate the available research into their designs and school boards will make researched based decisions at budget time.

SUMMARY

In summary, student achievement scores were higher when windows, floors, heat, roofs, locker conditions, celings, laboratory conditions, age of the facility, lighting, interior paint, mopped floors, cosmetic condtions in general were rated above standard by school staffs. Studies suggested that the facility often affected attitudes and behaviors as well.

With all of the many elements within the educational process that are outside the control of the educator, it is possible to provide a school building that exemplifies to the student the importance that the community, the state, or the nation places on education. The place where students learn can encourage good student behaviors and optimal student achievement.

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